

**Study Guide**

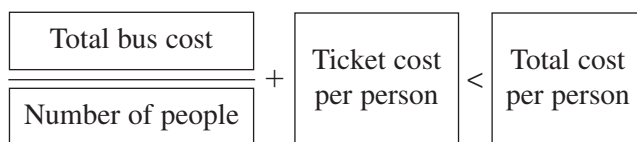
For use with pages 149–153

**GOAL** Solve multi-step inequalities.**EXAMPLE 1** Writing and Solving a Multi-Step Inequality

You are organizing a trip to a baseball game. Tickets are \$12 per person, and the cost to rent the bus will be divided evenly. Find the possible costs of the bus rental to keep the cost per person under \$20 if 30 people sign up to go on the trip.

**Solution**

Let  $t$  represent the total cost of the bus rental. Write a verbal model.



$$\frac{t}{30} + 12 < 20 \quad \text{Substitute.}$$

$$\frac{t}{30} + 12 - 12 < 20 - 12 \quad \text{Subtract 12 from each side.}$$

$$\frac{t}{30} < 8 \quad \text{Simplify.}$$

$$30 \cdot \frac{t}{30} < 30 \cdot 8 \quad \text{Multiply each side by 30.}$$

$$t < 240 \quad \text{Simplify.}$$

**Answer:** The total cost to rent the bus must be less than \$240 to keep the cost per person under \$20.

**Exercises for Example 1**

1. You are collecting sponsors for a 10-mile walk-a-thon. So far, you have collected \$230 in donations. How much must the last sponsor pledge per mile to reach or exceed your goal of \$300?
2. You are biking at a rate of 30 miles per hour. You have already biked 20 miles. How many more hours must you bike to surpass your goal of 50 miles?

**EXAMPLE 2** Solving a Multi-Step Inequality

$$-x + 31 < 19 \quad \text{Original inequality}$$

$$-x + 31 - 31 < 19 - 31 \quad \text{Subtract 31 from each side.}$$

$$-x < -12 \quad \text{Simplify.}$$

$$\frac{-x}{-1} > \frac{-12}{-1} \quad \text{Divide each side by } -1. \text{ Reverse inequality symbol.}$$

$$x > 12 \quad \text{Simplify.}$$

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**Exercises for Example 2**

Solve the inequality. Then graph the solution.

3.  $\frac{x}{-8} + 3 \leq -12$

4.  $\frac{m}{2} - 7 < -3$

5.  $-13x + 11 \geq 180$

**EXAMPLE 3****Combining Like Terms in a Multi-Step Inequality**

You are going to a dinner and a movie with a group of people. Individual dinners are \$7 per person, or the group can pay a lump sum of \$105 for a buffet. Tickets to the movie are \$5 each. How many people have to attend for the group cost of the buffet dinner and a movie to be less than the group cost for individual dinners and a movie?

**Solution**

There are two options: buying individual dinners or buying a buffet for everyone to share. Let  $p$  represent the number of people that attend the dinner and movie. Write a variable expression for the cost of each option.

Option 1: Individual Dinners

$$\left( \boxed{\text{Dinner price}} + \boxed{\text{Movie ticket price}} \right) \cdot \boxed{\text{Number of people}} \longrightarrow 12p$$

Option 2: Buffet

$$\boxed{\text{Buffet price}} + \boxed{\text{Movie ticket price}} \cdot \boxed{\text{Number of people}} \longrightarrow 105 + 5p$$

To find the values of  $p$  for which the group cost of option 2 is less than the group cost of option 1, write and solve an inequality.

$$\boxed{\text{Cost of option 2}} < \boxed{\text{Cost of option 1}}$$

$$105 + 5p < 12p \quad \text{Substitute.}$$

$$105 < 7p \quad \text{Subtract } 5p \text{ from each side and simplify.}$$

$$15 < p \quad \text{Divide each side by 7 and simplify.}$$

**Answer:** More than 15 people have to attend for the group buffet and movie option to be less than the individual dinner and movie option.

**Exercise for Example 3**

6. Tickets to your favorite team's games are \$12 each, and season tickets are \$396 for the same type of seat. Parking is \$5 per game. How many times do you have to use the season pass for the total cost of the season ticket option to be less than the total cost of the individual-game ticket option?